Diagnosing Lifelong Learners' Conceptual Development

Language Technologies for LifeLong Learning (**LTfLL**) project

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Cluster meeting Learner Network Service
20.10.2008

Overview

1. LTfLL project
2. Diagnosis of conceptual development
3. Current work
4. Questions

1. Languages Technologies for LifeLong Learning (LTfLL) project
Description

"The LTfLL project will create next-generation support and advice services to enhance individual and collaborative building of competences and knowledge creation in educational and organizational settings. The project makes extensive use of language technologies and cognitive models in the services"

- **Open Universiteit Nederland** - Netherlands (Coordinator)
- **Universiteit Utrecht** - Netherlands
- **Eberhard Karls Universität, Tübingen** - Germany
- **Wirtschaftsuniversität Wien** - Austria
- **Université Pierre-Mendès** - France
- **Politehnica University of Bucharest - National Center for Information Technology** - Romania
- **Aurus Kennis-en Trainingssystemen BV** - Netherlands
- **The University of Manchester** - United Kingdom
- **Institute for parallel processing of the Bulgarian Academy of Sciences** - Bulgaria
- **BIT MEDIA e-Learning solution GMBH and CO KG** - Austria

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3 Themes

1. Services for establishing the current position of the learner. Semi-automatic analysis and comparison of learners portfolios to the domain knowledge and continuous measurement of conceptual development (Using LSA)
2. Support feedback services based on analysis of learners' interactions and textual output (Using NLP and LSA)
3. Knowledge sharing infrastructure that allows comparison and sharing of private knowledge to give rise to new common knowledge and social learning (Using ontologies and social tagging)

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2. Diagnosis Conceptual Development
Theoretical Background

- **How to support medical students so they have the level of expertise required for a particular domain in a particular level**
  - Identify the current status of the learner's conceptual development *(person's knowledge of a domain by looking on how she organizes the concepts of such domain)*
  - → identify potentially weak knowledge areas and recommend remedial actions.
- Distinction between expert, novices and intermediate levels
  - Differ in their problem-solving skills, knowledge use, information processing, the time the use to provide diagnosis, and their well-organized knowledge structures

2. Diagnosis Conceptual Development
Theoretical Background

Arts et al. (2006), Boshuizen & Schmidt (1992; 2008), Jonassen et al. (1993), Nievelstein et al., (in press)

Novices	Intermediates	Experts
• Use every-day conceptual knowledge, knowledge less hierarchically structured • Novices structure concepts less well than experts. • Present problems in terms of literal characteristics. • Limited, incomplete knowledge, short texts, expressed in everyday language, both in the verbs and nouns.	• Much detail arguments, and long protocols • Have great difficulty with the activation of relevant knowledge when confronted with problems that are not in professional terminology (i.e. raw material)	• Larger numbers of ready-made illness scripts when dealing with a case • Present problems in terms of abstract principles • Give extensive explanations in which the links between different disciplines are given and activate knowledge through many roads (observation data, specific tasks, other hypothesis, ..) • jargon, instead of detail arguments

2. Diagnosis Conceptual Development
Theoretical Background

Boshuizen (2004), Nievelstein (2004)

Expertise Level	Knowledge Structure	Learning	Problem solving	***Reasoning process***	Demand on cognitive capacity
Novice	Networks (incomplete and loosely linked)	Knowledge accretion, integration and validation	Long chains of detailed reasoning steps through networks	Step by step process	High
Intermediate	Networks (tightly linked and integrated)	Encapsulation	Reasoning through encapsulated network; abbreviated	Big steps (but still one at the time)	Medium
Expert	Illness scripts	Illness script for formation	Illness script activation and instantiation	Groups of steps activated as a whole	Low
"Experienced expert"	Memory traces of previous cases	Instantiated scripts	Automatic reminding		Low

2. Diagnosis Conceptual Development
Measuring Conceptual Development

- Structural approach (Goldsmith et al.,1991) to assess the person's knowledge of a domain by looking on how she organizes the concepts of such domain

3 steps

1. Knowledge elicitation: Measures an individual's understanding of the relationships among a set of concepts.
   - Categorization methods: card sorting, word association
   - Graphical: concept maps, semantic networks
   - Verbal reporting: thinking-aloud, essay, essay questions
2. Knowledge representation methods: cluster analysis, three constructions, dimensional representation, pathfinder nets, verbal test.
3. Evaluation of an individual's knowledge representation relative to some standard (e.g., expert's organization of the concepts in the domain)
   - Qualitative assessment of derived representations
   - Quantifying the similarities between a student representation and a derived structure of the content of the domain
   - Compare the cognitive structures of experts and novices.

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3. Current work

Comparison

Knowledge
Elicitation

Conceptual Map
vs.
Text output

Expert
and
Text output

Knowledge
Evaluation

3. Current work

Comparison

Knowledge Elicitation

Conceptual Map

vs.

Text output

1. Exploring existing tools

JMap; SMD; MITOCAR

Infomap, PathFinder…

Knowledge Evaluation

Expert

and

Text output

2. Looking for suitable corpus

3. Defining Method of evaluation

Feedback, Questions, Comments…

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